

4



SEQUENCE LISTING

<110> Chambers, Thomas J.  
Guirakhoo, Farshad  
Monath, Thomas P.

<120> CHIMERIC FLAVIVIRUS VACCINES

<130> 06132/033003

<140> 09/121,587

<141> 1998-07-23

<150> 08/807,445

<151> 1997-02-28

<150> 09/007,664

<151> 1998-01-15

<160> 20

<170> FastSEQ for Windows Version 3.0

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<223> Derived from Yellow Fever virus and West Nile  
virus

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<223> Derived from Yellow Fever virus and West Nile  
virus

<400> 2

aaagccagtt gcagccgcgg tttaa

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<210> 3

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 <223> Derived from Yellow Fever virus and Dengue-1 virus  
  
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 gatcctcagt accaaccgcg gtttaa 26  
  
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 <400> 5  
 aaggtagatt ggtgtgcatt g 21  
  
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 aaccctcagt accaccgcg gtttaa 26  
  
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 <223> Derived from Yellow Fever virus and Dengue-3 virus  
  
 <400> 7

aaggtgaatt gaagtgtct a 21

<210> 8

<211> 25

<212> DNA

<213> Artificial Sequence

<220>

<223> Derived from Yellow Fever virus and Dengue-3 virus

<400> 8

acccccagca ccaccgcgg tttaa 25

<210> 9

<211> 21

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<223> Derived from Yellow Fever virus and Dengue-4 virus

<400> 9

aaaaggaaca gttgttctct a 21

<210> 10

<211> 25

<212> DNA

<213> Artificial Sequence

<220>

<223> Derived from Yellow Fever virus and Dengue-4 virus

<400> 10

accggaagtg tcaaccgcgg tttaa 25

<210> 11

<211> 21

<212> DNA

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<223> Derived from Yellow Fever virus and St. Louis  
Encephalitis virus

<400> 11

aacgtgaata gttgatagt c 21

<210> 12

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           Encephalitis virus

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 accgttggtc gcacccgcgg tttaa 25

<210> 13  
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 <223> Derived from Yellow Fever virus and Murray Valley  
           Encephalitis virus

<400> 13  
 aatttcgaaa ggtggaaggt c 21

<210> 14  
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 gaccggtggt tacagccgcg gtttaa 26

<210> 15  
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<222> (1)...(1983)

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Phe His Leu Thr Thr Arg Asn Gly Glu Pro His Met Ile Val Ser Arg  
1 5 10 15  
caa gag aaa ggg aaa agt ctt ttg ttt aaa aca gag gat ggc gtg aac 96  
Gln Glu Lys Gly Lys Ser Leu Leu Phe Lys Thr Glu Asp Gly Val Asn  
20 25 30  
atg tgc acc ctc atg gcc atg gac ctt ggt gaa ttg tgt gaa gac aca 144  
Met Cys Thr Leu Met Ala Met Asp Leu Gly Glu Leu Cys Glu Asp Thr  
35 40 45  
atc acg tac aag tgt ccc ctt ctc agg cag aat gag cca gaa gac ata 192  
Ile Thr Tyr Lys Cys Pro Leu Leu Arg Gln Asn Glu Pro Glu Asp Ile  
50 55 60  
gac tgc tgg tgc aac tcc acg tcc acg tgg gta acc tat ggg act tgt 240  
Asp Cys Trp Cys Asn Ser Thr Ser Thr Trp Val Thr Tyr Gly Thr Cys  
65 70 75 80  
acc acc acg gga gaa cat aga aga gaa aaa aga tca gtg gca ctc gtt 288  
Thr Thr Thr Gly Glu His Arg Arg Glu Lys Arg Ser Val Ala Leu Val  
85 90 95  
cca cat gtg gga atg gga ctg gag acg cga act gaa aca tgg atg tca 336  
Pro His Val Gly Met Gly Leu Glu Thr Arg Thr Glu Thr Trp Met Ser  
100 105 110  
tca gaa ggg gct tgg aaa cat gcc cag aga att gaa att tgg atc ctg 384  
Ser Glu Gly Ala Trp Lys His Ala Gln Arg Ile Glu Ile Trp Ile Leu  
115 120 125  
aga cat cca ggc ttc acc ata atg gca gca atc ctg gca tac acc ata 432  
Arg His Pro Gly Phe Thr Ile Met Ala Ala Ile Leu Ala Tyr Thr Ile  
130 135 140  
ggg acg aca cat ttc cag aga gca ctg att ttc atc tta ctg aca gct 480  
Gly Thr Thr His Phe Gln Arg Ala Leu Ile Phe Ile Leu Leu Thr Ala

145	150	155	160	
gtc gct cct tca atg aca atg cgt tgc ata gga ata tca aat aga gac				528
Val Ala Pro Ser Met Thr Met Arg Cys Ile Gly Ile Ser Asn Arg Asp				
	165	170	175	
ttt gta gaa ggg gtt tca gga gga agc tgg gtt gac ata gtc tta gaa				576
Phe Val Glu Gly Val Ser Gly Gly Ser Trp Val Asp Ile Val Leu Glu				
	180	185	190	
cat gga agc tgt gtg acg acg atg gca aaa aac aaa cca aca ttg gat				624
His Gly Ser Cys Val Thr Thr Met Ala Lys Asn Lys Pro Thr Leu Asp				
	195	200	205	
ttt gaa ctg ata aaa aca gaa gcc aaa cag cct gcc acc cta agg aag				672
Phe Glu Leu Ile Lys Thr Glu Ala Lys Gln Pro Ala Thr Leu Arg Lys				
	210	215	220	
tac tgt ata gag gca aag cta acc aac aca aca aca gaa tct cgt tgc				720
Tyr Cys Ile Glu Ala Lys Leu Thr Asn Thr Thr Thr Glu Ser Arg Cys				
	225	230	235	240
cca aca caa ggg gaa ccc agc cta aat gaa gag cag gat aaa agg ttc				768
Pro Thr Gln Gly Glu Pro Ser Leu Asn Glu Glu Gln Asp Lys Arg Phe				
	245	250	255	
gtc tgc aaa cac tcc atg gta gac aga gga tgg gga aat gga tgt gga				816
Val Cys Lys His Ser Met Val Asp Arg Gly Trp Gly Asn Gly Cys Gly				
	260	265	270	
tta ttt gga aag gga ggc att gtg acc tgt gct atg ttc aca tgc aaa				864
Leu Phe Gly Lys Gly Gly Ile Val Thr Cys Ala Met Phe Thr Cys Lys				
	275	280	285	
aag aac atg gag gga aaa gtt gtg cag cca gaa aac ttg gaa tac acc				912
Lys Asn Met Glu Gly Lys Val Val Gln Pro Glu Asn Leu Glu Tyr Thr				
	290	295	300	
att gtg gta aca ccc cac tca ggg gaa gag cat gcg gtc gga aat gac				960
Ile Val Val Thr Pro His Ser Gly Glu Glu His Ala Val Gly Asn Asp				
	305	310	315	320
aca gga aaa cat ggc aag gaa atc aaa gta aca cca cag agt tcc atc				1008
Thr Gly Lys His Gly Lys Glu Ile Lys Val Thr Pro Gln Ser Ser Ile				
	325	330	335	
aca gaa gca gaa ttg aca ggt tat ggc act gtc acg atg gag tgc tct				1056
Thr Glu Ala Glu Leu Thr Gly Tyr Gly Thr Val Thr Met Glu Cys Ser				
	340	345	350	
ccg aga aca ggc ctc gac ttc aat gag atg gtg ttg ctg cag atg gaa				1104

Pro	Arg	Thr	Gly	Leu	Asp	Phe	Asn	Glu	Met	Val	Leu	Leu	Gln	Met	Glu		
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aat	aaa	gct	tgg	ctg	gtg	cat	agg	caa	tgg	ttc	cta	gac	ctg	ccg	tta	1152	
Asn	Lys	Ala	Trp	Leu	Val	His	Arg	Gln	Trp	Phe	Leu	Asp	Leu	Pro	Leu		
	370					375				380							
cca	tgg	ctg	ccc	gga	gcg	gac	aca	caa	ggg	tca	aat	tgg	ata	caa	aaa	1200	
Pro	Trp	Leu	Pro	Gly	Ala	Asp	Thr	Gln	Gly	Ser	Asn	Trp	Ile	Gln	Lys		
385				390					395						400		
gaa	aca	ttg	gtc	act	ttc	aaa	aat	cct	cat	gcg	aag	aaa	cag	gat	gtt	1248	
Glu	Thr	Leu	Val	Thr	Phe	Lys	Asn	Pro	His	Ala	Lys	Lys	Gln	Asp	Val		
			405					410					415				
gtt	gtt	tta	gga	tcc	caa	gaa	ggg	gcc	atg	cac	aca	gca	ctc	aca	ggg	1296	
Val	Val	Leu	Gly	Ser	Gln	Glu	Gly	Ala	Met	His	Thr	Ala	Leu	Thr	Gly		
		420					425					430					
gcc	aca	gaa	atc	caa	atg	tca	tca	gga	aac	tta	ctc	ttc	aca	gga	cat	1344	
Ala	Thr	Glu	Ile	Gln	Met	Ser	Ser	Gly	Asn	Leu	Leu	Phe	Thr	Gly	His		
	435					440						445					
ctc	aag	tgc	agg	ctg	aga	atg	gac	aag	cta	cag	ctc	aaa	gga	atg	tca	1392	
Leu	Lys	Cys	Arg	Leu	Arg	Met	Asp	Lys	Leu	Gln	Leu	Lys	Gly	Met	Ser		
	450					455					460						
tac	tct	atg	tgc	aca	gga	aag	ttt	aaa	gtt	gtg	aag	gaa	ata	gca	gaa	1440	
Tyr	Ser	Met	Cys	Thr	Gly	Lys	Phe	Lys	Val	Val	Lys	Glu	Ile	Ala	Glu		
465				470					475					480			
aca	caa	cat	gga	aca	ata	gtt	atc	agg	gtg	cag	tat	gaa	ggg	gac	ggc	1488	
Thr	Gln	His	Gly	Thr	Ile	Val	Ile	Arg	Val	Gln	Tyr	Glu	Gly	Asp	Gly		
			485					490						495			
tct	cca	tgt	aaa	atc	cct	ttt	gag	ata	atg	gat	ttg	gaa	aaa	aga	cat	1536	
Ser	Pro	Cys	Lys	Ile	Pro	Phe	Glu	Ile	Met	Asp	Leu	Glu	Lys	Arg	His		
		500					505					510					
gtc	tta	ggt	cgc	ctg	atc	aca	gtc	aac	cca	att	gtg	aca	gaa	aaa	gat	1584	
Val	Leu	Gly	Arg	Leu	Ile	Thr	Val	Asn	Pro	Ile	Val	Thr	Glu	Lys	Asp		
		515					520					525					
agc	cca	gtc	aac	ata	gaa	gca	gaa	cct	cca	ttc	gga	gac	agc	tac	atc	1632	
Ser	Pro	Val	Asn	Ile	Glu	Ala	Glu	Pro	Pro	Phe	Gly	Asp	Ser	Tyr	Ile		
	530					535					540						
atc	ata	gga	gta	gag	ccg	gga	caa	ctg	aag	ctc	aac	tgg	ttt	aag	aaa	1680	
Ile	Ile	Gly	Val	Glu	Pro	Gly	Gln	Leu	Lys	Leu	Asn	Trp	Phe	Lys	Lys		
545				550					555						560		

gga agt tct atc ggc caa atg ttt gag aca aca atg agg ggg gcg aag 1728  
 Gly Ser Ser Ile Gly Gln Met Phe Glu Thr Thr Met Arg Gly Ala Lys  
 565 570 575

aga atg gcc att ttg ggt gac aca gcc tgg gat ttt gga tcc ctg gga 1776  
 Arg Met Ala Ile Leu Gly Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly  
 580 585 590

gga gtg ttt aca tct ata gga aaa gcc ctc cac caa gtc ttt gga gca 1824  
 Gly Val Phe Thr Ser Ile Gly Lys Ala Leu His Gln Val Phe Gly Ala  
 595 600 605

atc tat gga gct gcc ttc agt ggg gtc tca tgg act atg aaa atc ctc 1872  
 Ile Tyr Gly Ala Ala Phe Ser Gly Val Ser Trp Thr Met Lys Ile Leu  
 610 615 620

ata gga gtc att atc aca tgg ata gga atg aat tca cgc agc acc tca 1920  
 Ile Gly Val Ile Ile Thr Trp Ile Gly Met Asn Ser Arg Ser Thr Ser  
 625 630 635 640

ctg tct gtg tca cta gta ttg gtg gga gtc gtg acg ctg tat ttg gga 1968  
 Leu Ser Val Ser Leu Val Leu Val Gly Val Val Thr Leu Tyr Leu Gly  
 645 650 655

gtt atg gtg ggc gcc 1983  
 Val Met Val Gly Ala  
 660

<210> 18  
 <211> 661  
 <212> PRT  
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 Gln Glu Lys Gly Lys Ser Leu Leu Phe Lys Thr Glu Asp Gly Val Asn  
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 Met Cys Thr Leu Met Ala Met Asp Leu Gly Glu Leu Cys Glu Asp Thr  
 35 40 45  
 Ile Thr Tyr Lys Cys Pro Leu Arg Gln Asn Glu Pro Glu Asp Ile  
 50 55 60  
 Asp Cys Trp Cys Asn Ser Thr Ser Thr Trp Val Thr Tyr Gly Thr Cys  
 65 70 75 80  
 Thr Thr Thr Gly Glu His Arg Arg Glu Lys Arg Ser Val Ala Leu Val  
 85 90 95  
 Pro His Val Gly Met Gly Leu Glu Thr Arg Thr Glu Thr Trp Met Ser  
 100 105 110  
 Ser Glu Gly Ala Trp Lys His Ala Gln Arg Ile Glu Ile Trp Ile Leu  
 115 120 125



Arg	His	Pro	Gly	Phe	Thr	Ile	Met	Ala	Ala	Ile	Leu	Ala	Tyr	Thr	Ile
130						135					140				
Gly	Thr	Thr	His	Phe	Gln	Arg	Ala	Leu	Ile	Phe	Ile	Leu	Leu	Thr	Ala
145					150					155					160
Val	Ala	Pro	Ser	Met	Thr	Met	Arg	Cys	Ile	Gly	Ile	Ser	Asn	Arg	Asp
				165					170					175	
Phe	Val	Glu	Gly	Val	Ser	Gly	Gly	Ser	Trp	Val	Asp	Ile	Val	Leu	Glu
			180					185					190		
His	Gly	Ser	Cys	Val	Thr	Thr	Met	Ala	Lys	Asn	Lys	Pro	Thr	Leu	Asp
		195					200					205			
Phe	Glu	Leu	Ile	Lys	Thr	Glu	Ala	Lys	Gln	Pro	Ala	Thr	Leu	Arg	Lys
	210					215					220				
Tyr	Cys	Ile	Glu	Ala	Lys	Leu	Thr	Asn	Thr	Thr	Thr	Glu	Ser	Arg	Cys
225					230					235					240
Pro	Thr	Gln	Gly	Glu	Pro	Ser	Leu	Asn	Glu	Glu	Gln	Asp	Lys	Arg	Phe
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Val	Cys	Lys	His	Ser	Met	Val	Asp	Arg	Gly	Trp	Gly	Asn	Gly	Cys	Gly
			260					265					270		
Leu	Phe	Gly	Lys	Gly	Gly	Ile	Val	Thr	Cys	Ala	Met	Phe	Thr	Cys	Lys
		275					280					285			
Lys	Asn	Met	Glu	Gly	Lys	Val	Val	Gln	Pro	Glu	Asn	Leu	Glu	Tyr	Thr
	290					295					300				
Ile	Val	Val	Thr	Pro	His	Ser	Gly	Glu	Glu	His	Ala	Val	Gly	Asn	Asp
305					310					315					320
Thr	Gly	Lys	His	Gly	Lys	Glu	Ile	Lys	Val	Thr	Pro	Gln	Ser	Ser	Ile
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Thr	Glu	Ala	Glu	Leu	Thr	Gly	Tyr	Gly	Thr	Val	Thr	Met	Glu	Cys	Ser
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Pro	Arg	Thr	Gly	Leu	Asp	Phe	Asn	Glu	Met	Val	Leu	Leu	Gln	Met	Glu
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Asn	Lys	Ala	Trp	Leu	Val	His	Arg	Gln	Trp	Phe	Leu	Asp	Leu	Pro	Leu
	370					375					380				
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Val	Val	Leu	Gly	Ser	Gln	Glu	Gly	Ala	Met	His	Thr	Ala	Leu	Thr	Gly
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Leu	Lys	Cys	Arg	Leu	Arg	Met	Asp	Lys	Leu	Gln	Leu	Lys	Gly	Met	Ser
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Tyr	Ser	Met	Cys	Thr	Gly	Lys	Phe	Lys	Val	Val	Lys	Glu	Ile	Ala	Glu
465					470					475					480
Thr	Gln	His	Gly	Thr	Ile	Val	Ile	Arg	Val	Gln	Tyr	Glu	Gly	Asp	Gly
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Ser	Pro	Cys	Lys	Ile	Pro	Phe	Glu	Ile	Met	Asp	Leu	Glu	Lys	Arg	His
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Ser	Pro	Val	Asn	Ile	Glu	Ala	Glu	Pro	Pro	Phe	Gly	Asp	Ser	Tyr	Ile

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Gly Ser Ser Ile Gly Gln Met Phe Glu Thr Thr Met Arg Gly Ala Lys					
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Arg Met Ala Ile Leu Gly Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly					
	580		585		590
Gly Val Phe Thr Ser Ile Gly Lys Ala Leu His Gln Val Phe Gly Ala					
	595		600		605
Ile Tyr Gly Ala Ala Phe Ser Gly Val Ser Trp Thr Met Lys Ile Leu					
	610		615		620
Ile Gly Val Ile Ile Thr Trp Ile Gly Met Asn Ser Arg Ser Thr Ser					
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Leu Ser Val Ser Leu Val Leu Val Gly Val Val Thr Leu Tyr Leu Gly					
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Val Met Val Gly Ala					
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<210> 19

<211> 11916

<212> DNA

<213> Artificial Sequence

<220>

<223> Derived from Yellow Fever virus and Japanese Encephalitis virus

<400> 19

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<211> 3280

<212> PRT

<213> Artificial Sequence

<220>

<223> Derived from Yellow Fever virus and Japanese  
Encephalitis virus

<400> 20

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 85            90            95
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Ala	Gly	Trp	Trp	Trp	Trp	Trp	Ser	Thr	His	His	Asp	Arg	Arg	Asn	Cys
530						535					540				
Phe	Phe	Pro	Ser	Thr	Gly	Gly	Cys	Ala	Arg	Arg	Arg	Arg	Arg	Leu	Ser
545					550					555					560
Ser	Pro	Cys	Gly	Gly	Pro	Ile	Lys	Lys	Cys	Ala	Ala	Gln	Leu	Trp	Trp
			565						570					575	
Arg	Glu	Ser	Ser	Ser	Ser	Ser	Ser	Ala	Ala	Asp	Gly	Ile	Ile	His	Ile
			580					585					590		
Ile	Glu	Thr	Leu	Leu	Asp	Trp	Leu	Leu	Gln	Val	Val	Val	Val	Val	Ile
			595				600					605			
Leu	Ser	Ser	Lys	Ile	Ile	Val	Lys	Leu	Leu	Ile	Asn	Ser	Ser	Lys	Pro
	610					615					620				
Pro	Phe	Glu	Glu	Glu	Glu	Glu	Glu	Lys	Cys	Cys	Pro	Lys	Phe	Phe	Leu
625					630					635					640
Thr	Pro	Pro	Glu	His	His	Asp	Val	Glu	Glu	Ala	Gly	Gln	Gln	Gln	Gln
				645					650					655	
Met	Arg	Ser	Ser	Ala	Ile	Phe	Phe	Gly	Lys	Lys	Arg	Trp	Thr	Thr	Ser
			660					665					670		
Val	Val	Val	Ala	Gly	Gly	Gly	Gly	Gly	Lys	Glu	Cys	Cys	Thr	Arg	Arg
			675				680					685			
Gly	Thr	His	His	Ile	Phe	Gln	Gln	Phe	Gly	Gly	Gly	Leu	Gln	Gln	Gln
	690					695					700				
Gln	Gln	Gly	Trp	Trp	Asp	Leu	Gly	Gly	Arg	Thr	Leu	Leu	Phe	Ser	Ser
705					710					715					720
Arg	Glu	Glu	Glu	Met	Glu	Ala	Ala	Ala	Ala	Ser	Ser	Gly	Lys	Ser	Ser
				725					730					735	
Glu	Arg	Arg	Ala	Arg	Phe	Phe	Asn	Arg	Val	Val	Glu	Phe	Phe	Phe	Phe
			740					745					750		
Phe	Pro	Asp	Arg	Arg	Ser	Leu	Leu	Thr	Gly	Val	Val	His	His	Thr	Thr
		755					760					765			
Cys	Thr	Thr	Asp	Ala	Val	Val	Val	Val	Val	Glu	Tyr	Tyr	His	Arg	Leu
	770					775					780				
Leu	Met	Asp	Leu	Leu	Leu	Gly	Gly	Ser	Gly	Glu	Glu	Lys	Arg	Arg	
785					790					795					800
Arg	Arg	Val	Pro	Met	Met	Ser	Pro	Thr	Thr	Leu	Asp	Asp	Glu	Val	Met
				805					810					815	
Met	Val	Asn	Gly	Met	Asp	Asp	Asp	Asp	Asp	Pro	His	Leu	Leu	Arg	
			820				825					830			
His	His	Asp	Tyr	Lys	Lys	Val	Val	Val	His	His	Thr	Ile	Ile	Ile	Ile
		835					840					845			
Ile	Thr	Ser	Ser	Arg	Glu	Glu	Lys	Cys	Ser	Ser	Pro	Arg	Arg	Asn	Arg
	850					855						860			
Arg	Arg	Gln	Leu	Ala	Ala	Ala	Ala	Leu	Thr	Ile	Ile	Ile	Pro	Gly	Gly
865					870					875					880
Gln	Gly	Gly	Arg	Arg	Thr	Thr	Pro	Trp	Met	Met	Gly	Thr	Thr	Thr	Thr
				885					890					895	
Thr	Arg	Ser	Glu	Glu	Lys	Lys	Cys	Pro	Gly	Gly	Arg	Asp	Asp	Leu	
			900				905					910			
Met	Met	Asn	Cys	Asp	Asp	Asp	Asp	Asp	Arg	Gly	Gly	Ile	Asn	Gln	Gln
		915					920					925			
Pro	Pro	Arg	Arg	Ser	Gly	Gly	Ser	Tyr	Ser	Ser	Asn	Gly	Val	Val	Val



930		935		940
Val Ala Ala Pro Pro Thr Met Pro Pro Cys Glu Glu Ser Met Val Val				
945		950		955
Asp Gly Cys Cys Val Ser Ser Ser Ser Ser Gly Asn Gln Gly Gly Thr				960
	965		970	975
His Glu Glu Pro Ser Gly Gly Ala Pro Pro Val Thr Ala Ala Ala Ala				
	980		985	990
Ala Glu Ile Ile Cys Cys Pro Pro Leu Val Trp Trp Ser Met Met Asp				
	995		1000	1005
Ser Asn Asn Lys Trp Ser Ser Ser Ser Gly Lys Lys Gln Gly Pro Pro				
	1010		1015	1020
Ala Asn Asn Trp Leu Glu Glu Val Val Leu Leu Gly Ser Ser Ser Ser				
1025		1030		1035
Ser Ala Gly Arg Arg Lys Leu Leu Asp Asp Ala Glu Thr Thr Gln Trp				104
	1045		1050	1055
Trp Val Gly Leu Leu Leu Leu Leu Phe His His Asp Glu Gln Gln Glu				
	1060		1065	1070
Glu Thr Thr Met Tyr Tyr Gly Val Asp Asp Leu Pro Phe Phe Phe Phe				
	1075		1080	1085
Gln Ser Asp Asp Gly Leu Leu Leu Arg Leu Leu Gly Ser Gly Gly Leu				
	1090		1095	1100
Trp Ser Ser Ser Gly Gly Gly Gly Gly Pro Cys Ala Ala Pro Ala Ala				
1105		1110		1115
Met Met Gly Asp Cys Cys Trp Val Val Val Met Gly Gly Gly Gly Gly				112
	1125		1130	1135
Leu Trp Trp Val Ser Lys Lys Gln Phe Leu Leu Cys Ile Ile Asp Asn				
	1140		1145	1150
Lys Lys Leu Leu Leu Leu Leu Leu Gly Lys Lys Ser Asn Thr Thr				
	1155		1160	1165
Leu Ala Ala Ser Trp Leu Leu Leu Thr Pro Pro His Tyr Tyr Tyr Tyr				
	1170		1175	1180
Tyr Gly Glu Glu Leu Pro Pro Met Phe Phe Phe Cys His Gly Gly Ser				
1185		1190		1195
Val Leu His His His His His Asn Phe Phe Gly His Leu Leu Cys Arg				120
	1205		1210	1215
Arg Arg Ile Pro Pro Gly Gly Pro Pro His Ser His His His His Leu				
	1220		1225	1230
Thr Trp Trp Leu Thr Gln Gln Phe Phe Phe Ala Cys Val Val Phe Leu				
	1235		1240	1245
Ala Ala Pro His His His His His Trp Ala Lys Lys Val Ser Ser Val				
	1250		1255	1260
Asn Glu Glu Thr Arg Ser Ser Leu Val Val Val Gly Val Val Val Val				
1265		1270		1275
Val Ala Gly Gly Gly Phe Ser Ser Arg Trp Arg Arg Phe Leu Leu Ser				128
	1285		1290	1295
Asp Cys Cys Leu Glu Asp Asp Asp Asp Ser Leu Val Ser Ser Gly Trp				
	1300		1305	1310
Trp Gly Trp Met Met Leu Glu Leu Leu Glu Ala Ala Ala Ala Ser				
	1315		1320	1325
Phe Phe Gly Lys Lys Glu Ala Glu Glu Gln Arg Glu Glu Pro Pro Pro				
1330		1335		1340

Tyr Asp Val Val Val Val Val Leu Ser Ser Thr Arg Gly Gly Ser Ser  
1345 1350 1355 136  
Cys Cys Ser Glu Glu Glu Ser Ala Ala Gly Thr Arg Arg Arg Arg Leu  
1365 1370 1375  
Ser Leu Ala Ala Gly Trp Trp Leu Pro Ser Ser Pro Phe Ala Ala Ser  
1380 1385 1390  
Ala Ala Ala Ala Ala Pro Cys Trp Trp Gly Cys Cys His Val Arg Arg  
1395 1400 1405  
Ser Glu Glu Val Gly Gly Val Leu Trp Trp Trp Trp Trp Ile Pro Pro  
1410 1415 1420  
Ser Asp Asp Ser Arg Asn Asn Glu His His Gly Gly Trp Trp Phe Met  
1425 1430 1435 144  
Ala Ala Ala Ala Tyr Ser Ser Ser Thr Phe Leu Leu Gly Leu Leu Ser  
1445 1450 1455  
Glu Glu Glu Gly Val Ala Ala Gly Arg Arg Arg Arg Arg Val Pro His  
1460 1465 1470  
His Cys Gly Gly Val Thr Arg Arg Ser Phe Pro Pro Ser Gly Gly Gly  
1475 1480 1485  
Lys Lys Lys Lys Lys Lys Ile Pro Pro Leu Gly Phe Phe Arg Lys Lys  
1490 1495 1500  
Leu Val Val Leu Trp Trp Trp His Gly Ser Ser Ser Ser Trp Lys Ala  
1505 1510 1515 152  
Ala Trp Asp Gly Gly Gly Arg Arg Ser Ser Ala Ala Val Val Arg Lys  
1525 1530 1535  
Lys Lys Lys Lys Arg Gly Gln Gln Ser Arg Arg Lys Pro Ser Ser Val  
1540 1545 1550  
Gln Ser Ser Gly Met Met Gly Glu Ile Ile Ile Ile Ala Val Val  
1555 1560 1565  
Ser Leu Leu Arg Val Ala Ala Ser Gly Gly Ser Tyr Cys Cys Thr Gly  
1570 1575 1580  
Thr Thr Thr Thr Glu Arg Gly Leu Tyr Tyr Gln Trp Trp Ser Leu Ser  
1585 1590 1595 160  
Ser Asp Asn Ser Ser Arg Val Val Val Val His Ile Pro Pro Leu  
1605 1610 1615  
Arg Arg Lys Glu Glu Lys Gly Gly Ser Lys Lys Ile Pro Thr  
1620 1625 1630  
Thr Thr Thr Thr Leu Lys Lys Arg Asn Asp Asp Leu Ser Leu Leu Phe  
1635 1640 1645  
His His Trp Ser Trp Trp Arg Gln Asp Asp Asp Asp Val Ser Ser Ser  
1650 1655 1660  
Gln Ile Leu Leu Arg Val Val His Gly Asp Asp Leu Arg Thr Thr Cys  
1665 1670 1675 168  
Val Val Val Val Val Pro His Gln Gln Leu Phe Phe Ser Glu Met Met  
1685 1690 1695  
Gly Gly Phe Phe Thr Ala Ala Asp Val Lys Lys Lys Lys Lys His Thr  
1700 1705 1710  
Thr Gly Phe Phe Phe Leu Thr Ala Ala Gly Arg Arg Ser His Pro Cys  
1715 1720 1725  
Ala Ala Ala Ala Met Pro Pro Thr Tyr Arg Arg Val Gly Gly Gln  
1730 1735 1740  
Leu Gly Gly Val Asn Trp Trp Ser Asp Asp Asp Asp Asp Tyr Gly Pro

1745		1750		1755		176
Ile Ile Leu Asp	Pro Pro His Ser Ser	Leu Glu Glu Trp	Ala Ala Ala			
	1765		1770		1775	
Ala Ala Ala Arg	Ala Ala Gly Lys Val	Gln Gln Gln Leu	Met Met Ser			
	1780		1785		1790	
His Thr Thr Leu	Gly Leu Leu Leu Leu	Val Met Asn Asn	Pro His Ser			
	1795		1800		1805	
Ser Trp Lys Met	Met Gln Thr Asp Asp	Thr Gln Gln Gln	Gln Gln Ala			
	1810		1815		1820	
Leu Glu Glu Gln	Gly Gly Asp Trp Ile	Ile Gly Gln Gln	Gly Pro Pro			
1825		1830		1835		184
Ala Trp Phe Phe	Phe Phe Phe Pro Ser	Ser Gln Ser Cys	Cys Met Ser			
	1845		1850		1855	
Trp Trp Ala Ser	Ser Ala Gly Gly Glu	Arg Val Val Val	Val Val Trp	Trp		
	1860		1865		1870	
Ser Ser Asn Arg	Lys Lys Leu Glu Asn	Thr Thr Thr Ile	Lys Lys Glu			
	1875		1880		1885	
Glu Glu Glu Glu	Glu Leu Tyr Tyr Trp	Pro Pro Asp Ile	Ala Ala Asn			
	1890		1895		1900	
Gly Ser Ser Thr	Phe Phe Val Glu Arg	Arg Arg Arg Arg	Leu Asp Asp			
1905		1910		1915		192
Gln Asp Gly Gly	Leu Ser Leu Leu Leu	Val Val Arg Glu	Glu Glu Arg	Trp		
	1925		1930		1935	
Gln Gln Gln Gln	Lys Gly Gly Leu Arg	Ile Ile Arg Ile	Ile Ile Leu	Leu		
	1940		1945		1950	
Leu Leu Arg Arg	Gly Gly His Trp Trp	Trp Trp Trp Lys	Ser Gln Gln			
	1955		1960		1965	
Glu Met Met Asp	Ser Tyr Tyr Leu Phe	Leu Gln Gln Glu	Asn Asn Asn			
	1970		1975		1980	
Asn Asn Asn His	His His His Leu Leu	Val Val Arg Pro	Gln Gln Leu	Leu		
1985		1990		1995		200
Leu Gln His Gly	Gly Gly Gly Val Val	Val Val Glu Trp	Ser Ser Pro	Leu		
	2005		2010		2015	
Tyr Tyr Arg Glu	Leu Lys Lys Pro Val	Ser Ser Trp Glu	Thr Glu Glu			
	2020		2025		2030	
Met Thr Thr Arg	Lys Val Val Gln Arg	Thr Thr Gly Gly	Cys Asp Leu			
	2035		2040		2045	
Leu Leu Leu Leu	Val Trp Trp Phe Val	Ala Ala Trp Pro	Arg Arg Gly			
	2050		2055		2060	
Leu Leu Asp Glu	Val Ser Gly Gly Gly	Gly Val Leu Lys	Lys Pro Glu			
2065		2070		2075		208
Glu Glu Asp Asp	Met Thr Thr Gly Glu	Thr Thr Glu Val	Val Val Val			
	2085		2090		2095	
Val Gly Ser Trp	Trp Glu Gln Gln Lys	Pro Leu Leu Pro	Lys Val Val			
	2100		2105		2110	
Val Met Met Arg	Val Ser Ser Ser Ser	Asp Gln Gln Cys	Ala Val			
	2115		2120		2125	
Val Asn Leu Leu	Leu Phe Ala Ala Arg	Glu Glu Glu Leu	Leu Leu Leu			
	2130		2135		2140	
Leu Lys Cys Val	Leu Ser Thr Pro Pro	Ile Ser Trp Trp	Lys Lys			
2145		2150		2155		216

Gly Gly Arg Gly Gly Gly Gly Gly Gly Tyr His His Val Cys Cys Leu	2165	2170	2175
His Ser Ser Gly Arg Leu Leu Gly Leu Leu Arg Asn Ala Ala Ala Ala	2180	2185	2190
Ala Ser Met Met Ala Gly Gly Gln Met Leu Leu Tyr Thr Gly Gly Asp	2195	2200	2205
Tyr His Arg Glu Glu Val Ile Phe Phe His Val Val Pro Lys Ala Ala	2210	2215	2220
Ser Arg Met Met Tyr Gly Gly Gly Gly Gly Gly His Asn Asn Pro Ala	2225	2230	2235
Ala Gly Tyr Leu Leu Val Pro Trp Trp Ala Ser Ser Pro Thr His His	2245	2250	2255
His His His Ser Tyr Tyr His Ala His His Ser Leu Ser Ser Met Val	2260	2265	2270
Val Cys Asp Pro Pro Ser Gln Gly Gly Gly Gly Asn Lys Gly Gly Ile	2275	2280	2285
Gln Asp Asp Pro Ser Ser His Thr Ser Ser Ile Gly Ile Ile Asp Ala	2290	2295	2300
Ala Ala Ala Ala Phe Ser Gly Gly Gln Pro Pro Glu Leu Gly Gly Ala	2305	2310	2315
Gly Glu Glu Pro Lys Lys Asp Leu Phe Phe Phe Phe Phe Lys Lys Lys	2325	2330	2335
Leu Asn Ser Ser Leu Val Leu Leu Pro Trp Trp Leu Ala Gly Gly Leu	2340	2345	2350
Thr Ser Gln Glu Glu Ala Trp Thr Thr Val Arg Arg Ala Leu Leu Leu	2355	2360	2365
Met Leu Ser Ser Asn Val Val Val Val Val Pro Leu Asp Asp Lys Ser	2370	2375	2380
Ser Tyr Gly Asn Asn Val Ser Val Val Glu Gln Ser Ala Ala Ala Ala	2385	2390	2395
Ala Val Leu Leu Phe His Gly Gly Arg Gly Tyr Tyr Phe Met Met Asp	2405	2410	2415
Glu Tyr Tyr Arg Ser Cys Cys Trp Trp Ser Gly Trp Trp Phe Asn Asn	2420	2425	2430
Gln Cys Cys Leu Leu Cys Cys His Arg Arg Arg Arg Arg Arg His Ala	2435	2440	2445
Ala Thr Gly Gly Leu Ile Leu Leu Trp Asn Gln Gln Arg Ser Ser Ser	2450	2455	2460
Lys Leu Leu Leu Leu Leu Gln Arg Arg Gly Val Pro Pro Ala Leu Pro	2465	2470	2475
Pro Asn Pro Pro Gly Trp Trp Ile Gln Gln Gln Gln Gln Leu Thr Leu	2485	2490	2495
Leu Glu Ala Pro Pro Asn Ala Ala Pro Phe Met Met Lys Lys Leu Leu	2500	2505	2510
Ser Ile Ile Ile Ile Ile Pro Ser Cys Cys Ser Ala Ala Ala Ser Val	2515	2520	2525
Val His Val Gln Gln Arg Pro Pro Ser Leu Ala Ala Ala Ala Gly	2530	2535	2540
Ile Ile Pro Ser Ile Ile Leu Pro Pro Leu Leu Arg Gly Lys Lys Pro	2545	2550	2555
Ala Phe Phe Phe Phe Phe Gly Met Met Pro Met Ala Ala Leu His His			

															2565			2570			2575		
Gln	Glu	Ser	Ser	Arg	Gly	Asn	Asn	Leu	Cys	Cys	Cys	Cys	Cys	Cys	Gly								
				2580			2585			2590													
Ser	Ser	Cys	Thr	Thr	Leu	Trp	Lys	Lys	Glu	Asn	Trp	Trp	Ala	Gly	Gly								
				2595			2600			2605													
Ser	Ala	Asn	Asn	Asn	Asn	Asn	Lys	Thr	Thr	Gly	Ser	Ser	Gly	Arg	Gly								
				2610			2615			2620													
Gly	Leu	Asn	Asn	Val	Gly	Gln	Gln	Asp	Ser	Leu	Leu	Leu	Leu	Ser	Cys								
2625				2630			2635			264			264										
Ile	Ile	Arg	Thr	Asp	Asp	Cys	Gly	Gly	Trp	Ile	Val	Val	Thr	Ala	Arg								
				2645			2650			2655													
Arg	Ala	Phe	Phe	Phe	Phe	Phe	Arg	Arg	Glu	Glu	Trp	Thr	Thr	Gly	Val								
				2660			2665			2670													
Ala	Ala	Leu	Gln	Gly	Gly	Pro	Gln	Gln	Leu	Arg	Trp	Trp	Trp	Trp	Trp								
				2675			2680			2685													
His	Glu	Glu	Trp	Leu	Cys	Cys	Ser	Trp	Lys	Lys	Arg	Val	Val	Pro	Gly								
2690				2695			2700																
Gly	Val	Ala	Ala	Ala	Ala	Ala	Glu	Ala	Gly	Gly	Tyr	Tyr	Ala	Ala	Cys								
2705				2710			2715			272			272										
Ala	Ala	Arg	Lys	Gly	Val	Lys	Lys	Ile	Tyr	Tyr	Tyr	Tyr	Tyr	Trp	Lys								
				2725			2730			2735													
Arg	Arg	Ala	Met	Met	Lys	Pro	Met	Met	Cys	Ala	Lys	Lys	Trp	Asp	Asp								
				2740			2745			2750													
Asn	Ile	Ile	Ile	Ile	Ile	Ile	Phe	Lys	Lys	Gln	Asn	Ser	Thr	Ala	Ala								
				2755			2760			2765													
Glu	Pro	Pro	Glu	Met	Pro	Phe	Cys	Cys	Cys	Cys	Val	Thr	Leu	Leu	Glu								
2770				2775			2780																
Ser	Ser	Ser	Val	Ile	Ile	Ser	Gln	Arg	Arg	Glu	Arg	Thr	Thr	Glu	Ser								
2785				2790			2795			280			280										
Ser	Ser	Ser	Ser	Tyr	Cys	Cys	Lys	Asn	Asn	Leu	Ala	Cys	Cys	Gly	Gln								
				2805			2810			2815													
Gln	Ser	Val	Val	Lys	Val	Leu	Leu	Leu	Leu	Leu	Pro	Tyr	Tyr	Ala	Arg								
				2820			2825			2830													
Cys	Cys	Leu	Arg	Asn	Asn	Glu	Leu	Leu	Pro	Lys	Glu	Glu	Leu	Ala	Glu								
				2835			2840			2845													
Glu	Glu	Glu	Gln	Ser	Ser	Asn	Pro	Leu	Leu	Gln	Glu	Glu	Pro	Leu	Met								
2850				2855			2860																
Met	Met	Tyr	Tyr	Tyr	Val	Trp	Trp	Trp	Trp	Trp	Pro	Gln	Gln	Gln	Ser								
2865				2870			2875			288			288										
His	His	Thr	Val	Asn	Asn	Asn	Ile	Pro	Pro	Ser	Arg	Arg	Met	Met	Met								
				2885			2890			2895													
Met	Met	Arg	Pro	Pro	Trp	Lys	Ser	Ser	Pro	Trp	Arg	Arg	Asp	Val	Val								
				2900			2905			2910													
Pro	Pro	Asn	Asn	Gly	His	Ala	Ala	Ala	Ala	Val	Leu	Arg	Arg	Asp	Lys								
				2915			2920			2925													
Gly	Gly	Pro	Gly	Gly	Lys	Arg	Pro	Pro	Glu	Glu	Arg												

Ser	Ser	Gly	Glu	His	His	Met	Val	Val	Val	Val	Leu	Leu	Lys	Lys	Leu
			2980						2985					2990	
Thr	Tyr	Tyr	Met	Gly	Gly	Gly	Arg	Arg	Val	Thr	Arg	Arg	Gly	Asn	Asn
			2995					3000					3005		
Asn	Asn	Asn	His	Asn	Asn	Leu	Leu	Leu	Gln	Gln	Arg	Arg	Val	Arg	Arg
			3010				3015					3020			
Lys	Leu	Leu	Thr	Arg	Ala	Ala	Ala	Ala	Ala	Asp	Pro	Pro	Ser	Gly	Asn
			3025			3030					3035				304
Asn	Gly	Arg	Ser	Ser	Lys	Val	Val	Gln	Gln	Val	Val	Cys	Ser	Ala	Ala
				3045					3050					3055	
Ala	Ala	Thr	Trp	Pro	Pro	Glu	Lys	Asn	Asn	Gln	Thr	Thr	Ala	Gln	Arg
			3060						3065					3070	
Arg	Glu	Phe	Ile	Ile	Lys	Ser	Ser	Ser	Ser	Ser	Lys	Ser	Cys	Cys	Pro
			3075				3080						3085		
Leu	Leu	Ala	Tyr	Leu	Leu	Arg	Thr	Arg	Arg	Ser	Gly	Gly	Thr	Ala	Asn
			3090				3095					3100			
Asn	Asn	Asn	Asn	Ala	Val	Val	Arg	Pro	Lys	Lys	Ser	Gly	Asn	Asn	Val
			3105			3110				3115					312
Asp	Asp	Arg	Lys	Glu	Glu	Cys	Thr	Asn	Asn	Asn	Asn	Lys	Ala	Gly	Gly
				3125					3130					3135	
Arg	Thr	Cys	Cys	Val	Gln	Gln	Trp	Gly	Gly	Arg	Glu	Lys	Lys	Ala	Val
			3140						3145					3150	
Val	Val	Val	Val	Val	Trp	Glu	Glu	Gln	Arg	Arg	Ser	Arg	Ala	Ala	Met
			3155					3160					3165		
Val	Tyr	Tyr	Gly	Trp	Trp	Ala	Arg	Tyr	Tyr	Tyr	Tyr	Tyr	Glu	Phe	Phe
			3170				3175					3180			
Gly	Pro	Gly	Gly	Ser	Met	Met	Asp	His	His	Gly	Phe	Gln	Gln	Lys	Thr
			3185			3190					3195				320
Gln	Gln	Gln	Gln	Glu	Glu	Glu	Glu	Glu	Gly	Ile	Ile	Leu	Thr	Thr	Thr
				3205					3210					3215	
Asp	Asp	Val	Ile	Arg	Arg	Pro	Gly	Gly	Gly	Gly	Gly	Asn	Gly	Trp	Trp
			3220					3225					3230		
Val	Asp	Asp	Tyr	Ala	Asp	Asp	His	Arg	Trp	Trp	Gly	Thr	Thr	Arg	Ile
			3235				3240						3245		
Thr	Thr	Thr	Thr	Ala	Asp	Asp	Arg	Arg	Ser	Ser	Asn	Tyr	Tyr	Glu	
			3250			3255					3260				
Pro	Thr	Thr	Thr	Lys	Asn	Asn	Asn	Trp	His	Lys	Lys	Val	Met	Glu	
			3265			3270				3275				328	